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BACTERIAL EVALUATION OF LOCAL HARD CHEESE (*CHUKU*) IN KATSINA- NIGERIA.

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ABSTRACT
A study was conducted to evaluate bacterial quality of 288 samples of local haed cheese (*Chuku*) procured from various retail outlets and markets in katsina town. The samples were analysed for the presence of bacterial organisms, using the conventional microbiological techniques for culture and identification. The results revealed the presence of *Escherichia coli*, *Klebsiella* sp., *Enterococcus* sp., *Listeria monocytogenes*, *Proteus* sp. and *Staphylococcus aureus*. Other isolates are *Bacillus* sp., *Streptococcus* sp., *Yersinia* sp and *Lactobacillus* sp. The isolation of *Escherichia coli*, *Klebsiella* sp., *Enterococcus* sp., *Listeria monocytogenes*, and *Staphylococcus aureus* from the samples are indication of poor hygienic conditions encountered during processing, storage and marketing of the product which is a possible threat to consumer health.

KEY WORDS: Bacteria, Food poisoning, Isolates, Local cheese, Katsina, Milk.

INTRODUCTION

Milk is inherently a very unstable fluid owing to its high moisture content and the suitability of milk as a growth substance for contaminants is responsible for the ease with which it becomes contaminated with microorganism (Salihu, *et al*., 2005). It is therefore, important to convert milk into various products of milk such as cheese, fermented milk, whey and other stable products of milk. Milk and milk products play vital roles in human nutrition and also serve as good medium for growth and transmission of many microorganisms to man. (Gill, et *al*., 1994).

Wherever, cattle are kept the Fulani men milked the cows and thereafter distribute the milk to the individual women in the encampment (Fulani farm-stead), the women decide on what will be done with the milk (Belewu and Aina, 2000). The milk is processed into various products such as cheese, fermented milk etc. There have been reported cases of out break of food poisoning associated with milk and milk products from developing and developed countries (Sharp, 1987). Although there are no surveillance activities in Nigeria, laboratory studies have shown the presence of food borne pathogens and high microbial load in some street food. (Umoh, *et al.,* 1984; Magaji, *et al.,* 2002: Adetunji, *et al.,* 2003). The local cheese (locally called *Chuku)* which is thin white to milky in appearance, slightly hard unripened with little moisture is sold in villages, markets, and crowded points in and around Katsina. Since the milk products constitute an integral part of the Nigerian diets (Aduku and Olukosi, 1991), attention should be paid more on the hygienic aspects of the distribution of such foods. Milk and milk products provide a favourable environment for microbial growth. Microbes can contaminate milk or milk products via animals themselves, the surrounding atmosphere, feedstuff, handling, equipment as well as the milker (ILCA, 1988; Belewu and Aina, 2000).

This study was undertaken to evaluate the bacterial organisms associated with local hard cheese (*Chuku*) so as to determine their safety for consumption.

MATERIAL AND METHODS

Preparation of local cheese hard (Chuku)

The local hard cheese is prepared in Nigeria by using vegetable rennet. The cheese is made from milk which is slowly heated in a pot while vegetable rennet extract of Sodom apple (*Calotropis procera*) which is commonly found in the tropics and sub-tropics is added. The plant contains calotropin enzyme which curdles the milk (Aworth, 1990; Kees, 1995; Anon, 1995). The extract is obtained by crushing the leaves and the

stems of the plant and then rinsed in a calabash with milk. The mixture is strained into warm milk with constant stirring and heating. Coagulation starts within 15-25 minutes after the addition of coagulant. The curd is boiled for sometime at least 20 minutes to inactivate the plant enzyme and facilitate whey expulsion after which the curd is strained through a sieve (usually a small raffia basket which facilitates whey drainage and gives characteristics shape and size to the cheese) and turned carefully. The fresh cheeses are then spread on tray or mats or flat wood to dry and become hard in the sun or in the shade.

Collection and processing of samples.

A total of 288 samples used for the study were procured every two weeks and randomly over a period of 24 weeks, from various retail outlets as well as from markets in Katsina metropolis. The procured cheeses were wrapped in foil papers from the point of collection and transported to the laboratory same day. Care was taken not to alter the condition of the samples as they are obtained from the sources where consumers purchase them for direct consumption. The samples were aseptically handled in the laboratory. Samples from each of the retail outlets were soaked in with distilled water in a beaker and covered with foil paper for 2 to 3 hours to allowed for the rehydration and softening of the cheese. A loopful each of the softened cheese samples was then inoculated into peptone water and selenite F broth respectively and incubated at 37^{O}C overnight. A loopful each from the peptone water was inoculated onto MacConkey agar, Blood agar and Eosin methylene blue (EMB) agar while a loopful of selenite F broth was inoculated on deoxycholate citrate agar (DCA). The media were inoculated in duplicate (except the DCA) and incubated aerobically and anaerobically at 37^{O}C for 24-48hrs. Colonies were randomly selected from each medium and restreaked on fresh media plate to obtain pure culture. Pure cultures of each isolates were stocked in agar slants in MacCarthney bottles. Colonies on the media were identified based on Bergy's manual and classification schemes proposed by Cheesbrough, (2000). The identification was based on morphology and the following characteristics particularly gram stain, morphology of the cells, motility and anaerobic condition as well as ability to produce catalase enzyme. Other tests include biochemical coagulase, oxidase, oxidation and fermentation tests, acid/gas production from sugar, urease test, hydrogen sulphide test, nitrate reduction test, phenylalamine deamination tests and haemolysis test.

RESULTS

A total of 10 different bacterial organisms that are of public health importance were isolated from the samples collected. These organisms include *Escherichia coli*, *Klebsiella* sp., *Enterococcus* sp., *Listeria monocytogenes*, *Proteus* sp. and *Staphylococcus aureus*. Other isolates are *Bacillus* sp., *Streptococcus* sp., *Yersinia* sp and *Lactobacillus* sp.

DISCUSSION

The high level of bacterial isolation in this study is an indication of unsanitary hygienic standard or condition post processing, storage, handling and retailing of the product. Indicator organisms like *Escherichia coli*, *Klebsiella* sp. and *Enterococcus* sp. are vital in milk and milk products to evaluate the microbiological safety and sanitary condition during processing and storage (Belewu and Aina, 2000). The presence of *E. coli* which is usually killed at $>55^{o}$C in 15 minutes in cheese is suggestive of post processing contamination (Adetunji *et al.*, 2003). The presence of *Klebsiella* sp in the product could partly be through air (sneezing, coughing, talking or singing) since the bacteria inhabit the upper respiratory tracts of humans (Belewu and Aina, 2000). The presence of *Escherichia coli* and *Klebsiella* sp. in milk and milk products has been reported in literature (Aworth and Egounlety, 1985; Joseph and Akinyosoye, 1997; Belewu and Aina, 2000; Adetunji *et al.*, 2003). The isolation of enterococcus in this study may be attributed to unhygienic handling as man is the reservoir of this organism.

The isolation of *Staphylococcus aureus* (coagulase positive) in this study is similar to the findings of Adesiyun, (1994) and Adetunji (2003). This bacterium is known to cause major food poisoning in both healthy and immunosuppressed patients (Alonge, 1993). *Staphylococcus aureus* produces an enterotoxins that are heat stable and are generally not destroyed during pasteurization or processing (Tatimi, 1981). *Listeria monocytogenes* has been incriminated in meningoencephalities, stillbirth and abortion in humans (Adams and Moss, 1999). Therefore, the isolation of *L. monocytogenes* in this study is an indication that the organism is an

important contaminant of milk products; this has a serious public health consequence. *Lactobacillus* sp is a lactic acid bacterium that is probably involved fermentation of the products. *Proteus* sp are usually pathogenic in cases of wounds, burns, viral infection or similar condition of impaired resistance; their isolation is of public health significant. This finding is similar to the findings of Belewu and Aina (2000).

The results show high amount of bacteria in the samples and this call for improved storage and retailing of the product. A high level of sanitary and hygienic condition should be instituted and maintained so as to establish microbial standards for this product which will go a long way in ensuring safer cheese and other milk products.

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